

PATENT SPECIFICATION

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(54) THE CONSTRUCTION OF PROTECTIVE COVERING LAYERS

(71) We, INTRUSION PREPAKT (U.K.) LIMITED, a British Company, of Fieldings Road, Cadmore Lane, Cheshunt, Hertfordshire, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—
 This invention relates to the construction of a protective covering layer on an upwardly-facing level or sloping ground or other surface, for example the construction of an anti-erosion covering layer on the surface of a sloping soil bank of a river or canal above water level, or on a shingle or sand beach. All such surfaces, level or sloping, will be referred to herein collectively by the term "ground surface".

According to the present invention, a method of constructing a protective covering layer on a ground surface (as herein defined), comprises laying on top of the ground surface to be protected a retaining mat having a self-supporting liquid-permeable fibrous or filamentary skeletal internal structure affording a multiplicity of intercommunicating air-filled interstices which are distributed throughout the entire thickness of the mat and are accessible through the upper face of the mat, and then applying to the upper face of the mat a settable filling material in liquid form, whose viscosity and composition are such that it will flow down into the interstices in the interior of the mat and be retained therein, and the filling material being supplied in such a manner and quantity as to fill the interstices and form, after setting a slab in which the mat is embedded.

The presence of the retaining mat on the ground surface will impede the flow of the settable liquid material, which is applied for example by spraying or squirting over the upper face of the mat, and will restrain the liquid from running straight down a sloping surface as it would tend to do in the absence of the mat. The liquid material will build up to form a slab of slightly greater thickness than the mat which will remain embedded in

the slab to form internal reinforcement when the slab has solidified. 50

The mat may be of woven fabric or of non-woven filamentary structure, for example nylon or other synthetic filament which has been directly extruded into an "expanded" matrix or web formation, somewhat like that of a conventional domestic nylon pot scourer. Again, the mat may be of wire or of coarse "steel wool", or equivalent material of some other metal, or may be of glass fibres or other fibres or filaments in a random distribution, resin-bonded at the crossing points of the fibres or filaments to make the mat self-supporting in the required "expanded" matrix formation. 55

The invention may be carried into practice in various ways, but one specific embodiment will now be described by way of example only and with reference to the accompanying drawing, which is a diagrammatic sectional elevation of a mat laid on a slope and partially-filled with cement grout. 60

In the embodiment illustrated, there is employed a retaining mat 10 of plastics filament, in this case nylon fibre, forming a flexible, self-supporting tangled skeletal structure of curled and randomly-directed plastics filaments which form an "expanded" web about half an inch thick and containing a multitude of intercommunicating internal spaces between the curled plastics filaments. 75

A section of this nylon mat, or superimposed sections, is or are laid on the sloping ground surface 11 to be protected and is or are pegged or pinned down by means of pegs or pins 10A, either directly thereon or in this case on top of an underlayer 12 of coarse-mesh reinforced netting, for example diagonal-mesh extruded-nylon net or chain-link plastic-coated wire netting, or an expanded-metal panel (XPM). A stop rail 13 is pinned horizontally to the ground at the lower edge of the mat 10. 80

Cement grout 14 (a mixture of cement, sand, water and chemical additives) in a viscous liquid state is then squirted or 85

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sprayed onto the upper surface of the mat 10 by means of an applicator nozzle shown diagrammatically at 15. A suitable grout composition for this purpose for use on a slope of 45° to 60° comprises a mixture of 2:1 by weight of sand and cement, the sand grading being in the range Zones 1 to 4, and preferably Zone 4, of the Ministry of Works scale, and the mixture having a water content of 0.4 to 0.5% and having 1% of Intrusion-Aid fluidizing agent (a proprietary composition marketed by the Applicant), both these latter percentages being percentages of the weight of cement in the mixture. 5

10 The grout 14 is squirted or sprayed onto the upper surface of the mat 10 from the nozzle 15 which is traversed over the upper face of the mat widthwise and horizontally, and is moved upwardly in successive small steps 15 between the traverses so that the grout is applied progressively to the whole of the upper face of the mat and enters the internal spaces within it, building up progressively 20 into a slab 16 whose thickness is 3/4 to 1 inch, the mat 10 and any underlying reinforcement netting 12 becoming embedded in the cement slab. The nylon mat 10 acts as 25 a restraining agent for the viscous grout 14 which would otherwise run down the slope 30 11 before it had set. After the grout 14 has set in and around the nylon mat 10, it forms the rigid cement slab 16 reinforced internally by the nylon mat 10 and by the underlying coarse net reinforcement 12 (if 35 provided).

Since the mat 10 is flexible it will accommodate itself to irregularities in the ground surface 11 on which it is laid as with the finished slab 16.

40 If a protective covering layer of greater thickness than the slab 16 is required, a second nylon mat 10 may be laid onto the newly-applied cement slab 16 before the latter has had time to set completely, and a further layer of grout may then be applied to the second mat, in the manner described, to build up a second cement layer which will become bonded to the first layer and will form therewith a double-thickness cement 45 slab. Further layers of nylon mat may be laid and grouted to increase the thickness of the slab as may be required.

50 Instead of using a cement grout to build up a slab in and around the nylon mat 10, a micro-concrete mixture in viscous liquid form may be used. This is a stiff but flowable concrete mix with suitably-graded fines containing controlled amounts of water and plasticising agent in the mix to give the 55 required fluidity. If the concrete is required to contain larger lumps of solids than are usually present in a micro-concrete mix, these larger pieces must not exceed in size a certain proportion e.g. 1:20, of the mean 60 width of the spaces in the nylon mat 10.

65 The slope of the surface 11 on which the covering layer is to be laid is also a factor in the process. Broadly speaking, the steeper the slope the more viscous must the settable liquid material be, and/or the closer the web formation of the nylon mat 10. The limiting slope on which this method can be used is expected to be about 60°. 70

The cement or concrete slab 16 may either be impervious after it has set, or it may be arranged to set as a porous slab, for example by the incorporation of a chemical blowing agent in the mix, to allow the growth of grass or other plants on the surface of the finished ground covering layer, which will be of irregular but generally flat form corresponding to the profile of the ground on which it is laid. 75

It will be understood that whilst the method of the present invention is primarily intended for use on sloping surfaces, it is perfectly possible to use the same method to construct a protective covering layer on a surface which is partly or wholly level. 80

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WHAT WE CLAIM IS:—

1. A method of constructing a protective covering layer on a ground surface (as herein defined) which comprises laying on top of the ground surface to be protected a retaining mat having a self-supporting liquid-permeable fibrous or filamentary skeletal internal structure affording a multiplicity of intercommunicating air-filled interstices which are distributed throughout the entire thickness of the mat and are accessible through the upper face of the mat, and then applying to the upper face of the mat a settable filling material in liquid form, whose viscosity and composition are such that it will flow down into the interstices in the interior of the mat and be retained therein, and the filling material being supplied in such a manner and quantity as to fill the interstices and form, after setting, a slab in which the mat is embedded. 100
2. A method as claimed in Claim 1, in which the mat comprises a woven fabric, or a non-woven filamentary web structure. 105
3. A method as claimed in Claim 2, in which the mat is of nylon or other synthetic fibre which has been directly extruded into a web formation. 110
4. A method as claimed in Claim 2 in which the mat is of wire, or of coarse "steel wool" or equivalent material of some other metal. 115
5. A method as claimed in Claim 2 in which the mat is made of filaments or fibres, for example glass-fibre, in a random disposition and resin-bonded at the crossing points of the fibre. 120
6. A method as claimed in any one of Claims 1 to 5 in which two or more sections of the mat are laid on the ground surface, 125

superimposed upon one another to form a laminated mat structure, the settable filling material in liquid form being then applied to the laminated structure.

5 7. A method as claimed in any one of Claims 1 to 5 in which after the mat has been laid and the settable filling material has been applied to it and before the latter has completely set, a second mat is laid onto the slab

10 so formed and additional settable liquid filling material is applied to the upper face of the second mat to penetrate and fill the latter and become bonded to the first slab to form a double-thickness slab.

15 8. A method as claimed in Claim 7 in which the laying of a further mat on the previously-formed slab and the application of further settable filling material are repeated one or more times to form a multi-thickness slab.

9. A method as claimed in any one of the preceding Claims, in which the settable filling material comprises a cement grout.

10. A method as claimed in any one of

25 Claims 1 to 8, in which the settable filling material comprises a micro-concrete.

11. A method as claimed in any one of the preceding Claims, in which the settable filling material contains a chemical blowing agent and is allowed to expand and form a porous slab after application to the mat.

12. A method as claimed in any one of the preceding claims in which the ground surface on which the layer is laid is sloping, and which includes the step of fixing a horizontal stop rail along the foot of the mat to define the edge of the subsequently-constructed slab.

13. A method as claimed in Claim 12 in which the settable filling material is applied in liquid form through a nozzle to the upper face of the mat, the nozzle being traversed horizontally in successively-higher application strokes over the whole upper face of the mat.

14. A method as claimed in any one of the preceding claims, including the preliminary step of laying a coarse-mesh reinforcing net or expanded panel on the surface to be protected, the mat being laid on top of the reinforcing net or panel.

15. A method of constructing a protective covering layer on a ground surface, substantially as specifically described herein with reference to the accompanying drawing.

16. A protective covering layer formed on a ground surface by the method claimed in any one of the preceding Claims.

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COMPLETE SPECIFICATION

1 SHEET

*This drawing is a reproduction of
the Original on a reduced scale*

